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#### (54) Closure for pipes or vessels

(57) A closure (2) for an opening in a pressure pipe or vessel (1) has a centre piece rotated by a lever (5) and four locking members (3) each pivoted at one end on a respective eccentric (7) itself pivoted on the closure. The centre piece is connected to the eccentrics (7) by first links (6) which serve to rotate the eccentrics on angular movement of the lever (5). The rotation of the eccentrics (7) causes the said one ends of the locking members (3) to be moved into locking engagement with a locking recess (13). A plurality of second links (10) are connected one between each eccentric (7) and the other ends of the next adjacent locking members (3) to simultaneously move the other ends of the locking members (3) into locking engagement.

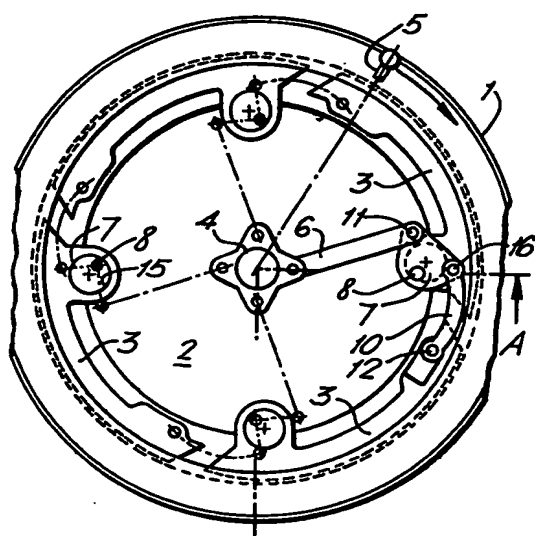


FIG. 1.

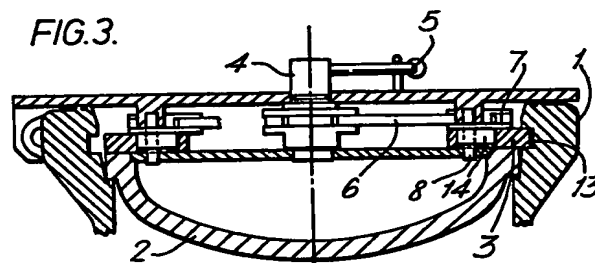


FIG. 3.

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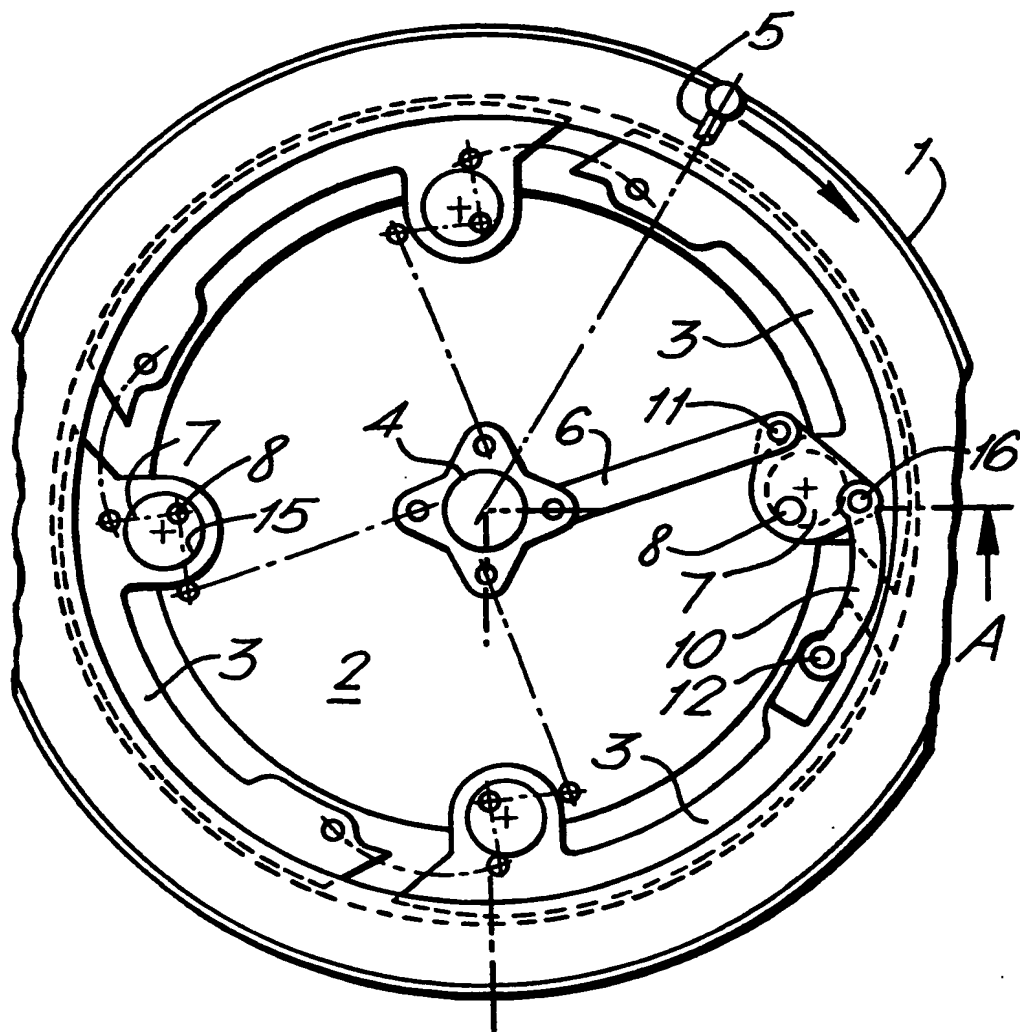
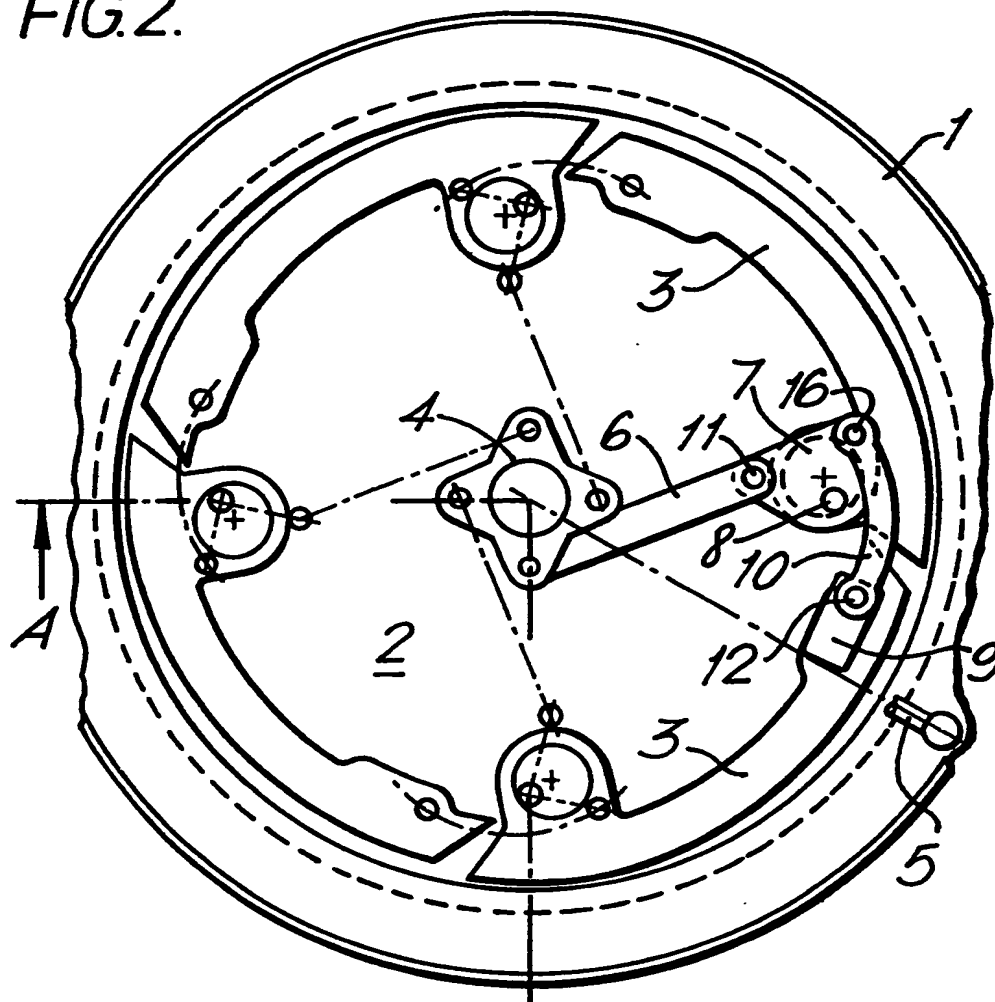
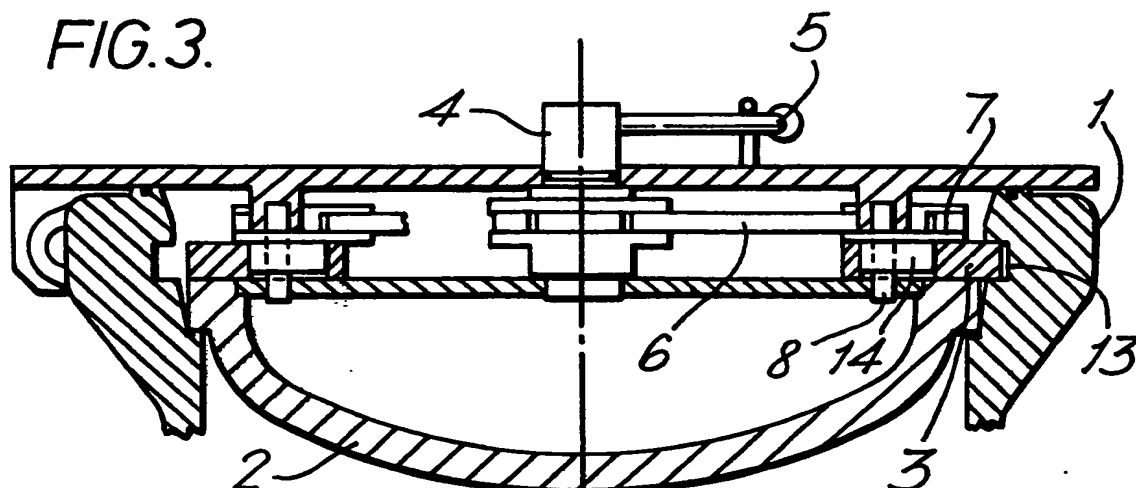


FIG. 1.

**FIG. 2.**

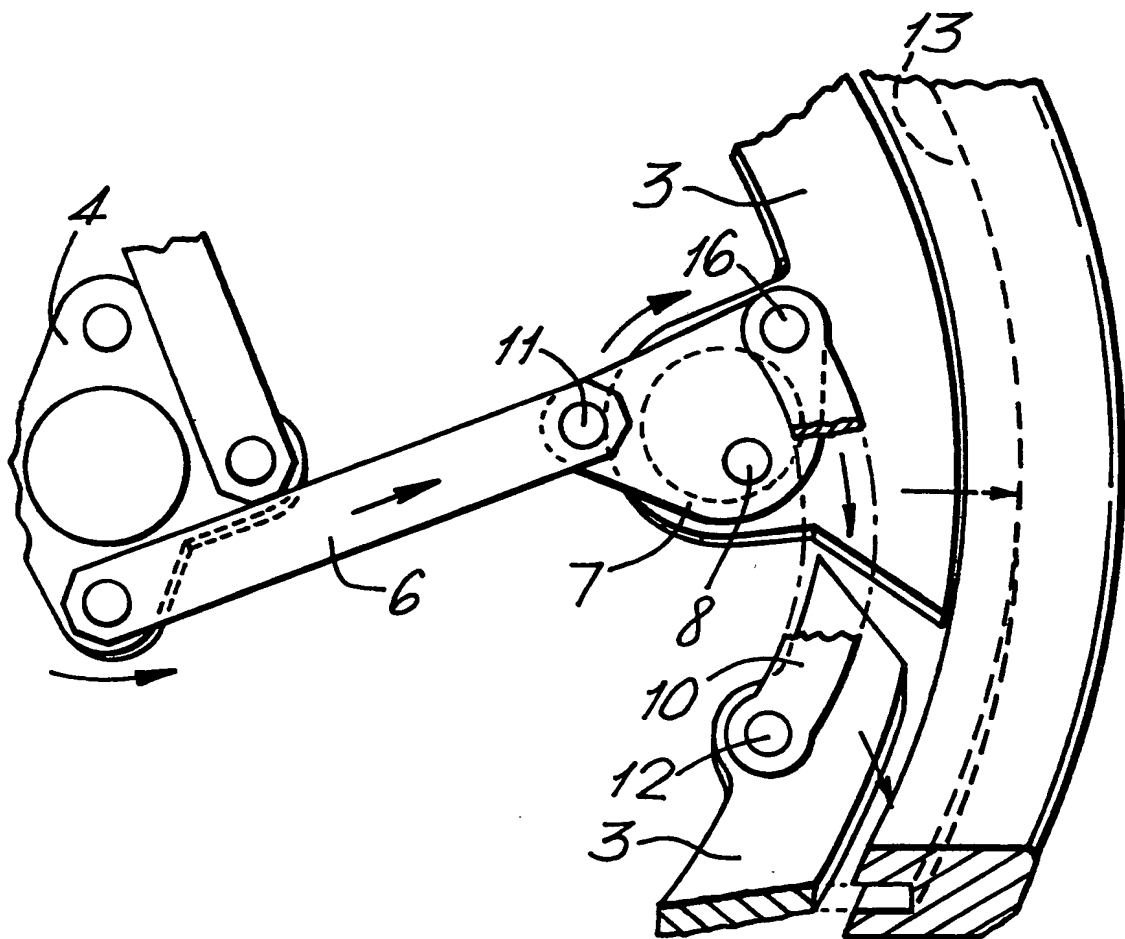


*FIG. 3.*



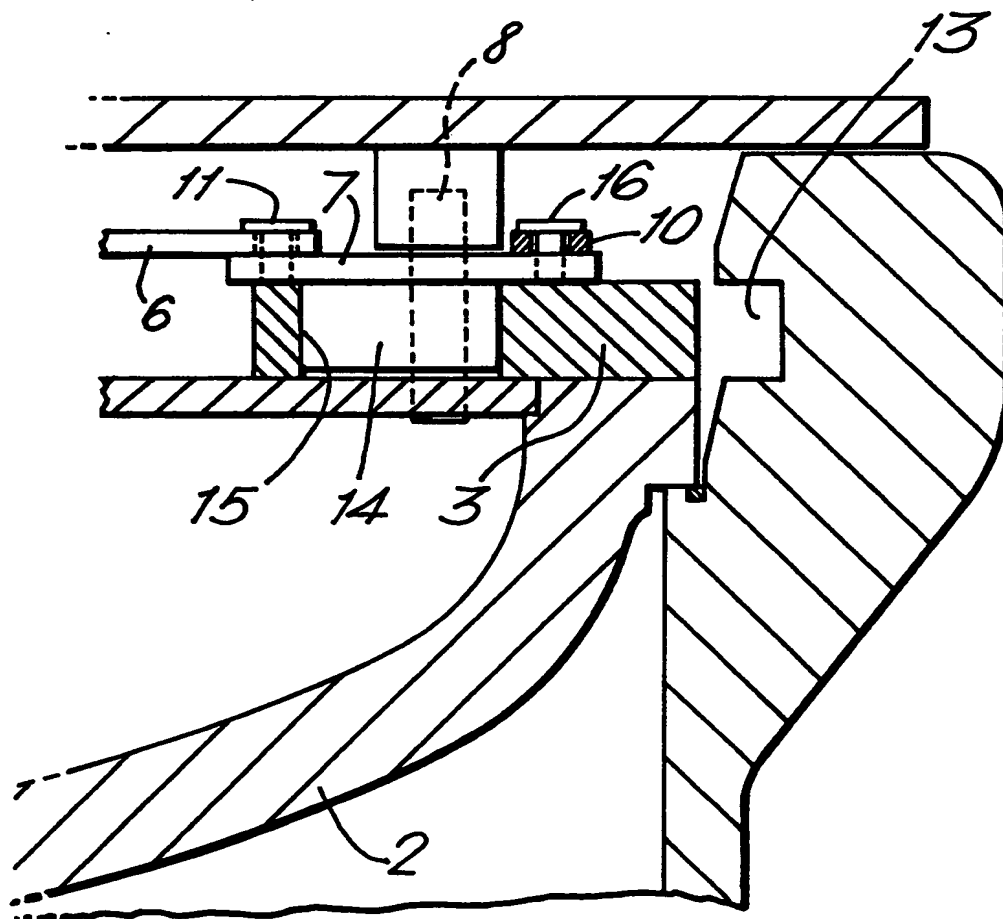
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FIG.4.



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FIG.5.



## SPECIFICATION

### Closure for pipes or vessels

5 This invention relates to an improved closure for pipes or vessels.

In our prior British Patent Specification No. 1181757 there is disclosed a closure for an opening in a pressure pipe or vessel adapted to co-operate with a circular groove or bead around the opening, the closure comprising a circular cover, an angularly displaceable member pivoted at the centre of the cover, and at least two accurate locking members positioned around the periphery of the cover, each locking member being linked at one end to the angularly displaceable member and pivoted at the other end on the cover adjacent to the periphery of the cover, so that in operation when the closure is fitted to the container and the angularly displaceable member turned in the required direction relative to the cover, the locking members move into engagement with the groove or bead thereby locking the closure in position.

Whilst our present closure is perfectly satisfactory the locking arrangement is such that there is a gap at each pivot point where the arcuate locking piece does not enter the annular slot so that the total engagement of the locking pieces is approximately 70-75%. In order to accept higher pressures without more unit load on the locking pieces we now propose to provide increased engagement, preferably more than 90% and almost 100%.

According to the present invention there is provided a closure for an opening in a pressure pipe or vessel arranged to co-operate with locking means around the opening, the closure comprising a cover, an angularly displaceable member on the cover, a plurality of elongate locking members positioned around the periphery of the cover, and link means extending between the angularly displaceable member and the locking members operable to move both ends of each locking member into a locking position upon appropriate angular movement of the displaceable member.

In one embodiment the link means may comprise two links for each locking member one link extending to one end of the locking member and the other link extending to the other end.

Alternatively the link means may comprise a first link from the angularly displaceable member to an eccentric member which pivots on the closure and has a driving surface engaging a surface on one end of a first locking piece, and a second link pivoted on the eccentric member and an adjacent end of a second locking piece whereby the respective ends of the locking pieces are moved into their locking position.

55 The invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 illustrates a closure of the present invention with the locking members in the closed position;

60 Figure 2 is a view, similar to Figure 1, but with the locking members in the open position;

Figure 3 is a cross-sectional view of A-A in Figures 1

and 2 showing the closure in the closed and open positions;

65 Figure 4 is a diagrammatic enlarged sketch of one part of the locking mechanism in plan view.

Figure 5 is a diagrammatic enlarged sketch of Figure 4 in section.

In the drawings a closure 2 for closing an opening in a pressure pipe or vessel 1 has four arcuate locking pieces 3 for locking the closure 2 in position. The locking pieces 3 are operable to engage in a recess 13 (Figure 3) to lock the closure 2 on angular movement of a centre lever 5 to which the locking pieces 3 are connected by means of a link 6. Disposed at one end of each locking piece 3 is an eccentric member 7 which pivots on a pin 8 fixed to the closure, and which has a depending driving portion 14 engaging within a circular opening 15 in the end of the locking piece 3. The link 6 is pivoted to the eccentric member 7 at 11 so that, on angular movement of the centre lever 5, the driving portion 14 of the eccentric member 7 moves that end of the respective locking piece 3 into the locking recess 13.

85 The other end of a locking piece 3 is moved into the locking recess 13 by means of a link 10 pivotally connected at 16 and 12 between the eccentric member 7 of an adjacent locking piece 3 and the end of the locking piece 3 itself respectively.

90 The arrangement of the present invention ensures that, as the operating lever 5 is moved up to lock the closure 2, both ends of the locking pieces 3 move into the locking recess 13 at the same time. Moreover, by moving both ends at the same time and suitably configuring the ends of the locking pieces so that they lie closely together in the open position, almost 100% of the recess is occupied by the locking pieces 3: preferably there are now four locking pieces 3, the angle of engagement being about  $328^\circ$  with  $8^\circ$  spaces between adjacent locking pieces 3.

100 Although a locking recess 13 has been described it will be understood that the locking pieces may engage a locking bead on the inside of the opening the closure. Preferably the closure to the pipe or vessel includes a releasable bridge member for interconnection between the closure and the pipe or vessel arranged so that initially on disengagement of the, or each, locking member, the closure can only be partially opened into a position in which the bridge member may be released to allow the closure to be completely opened. Also the closure may include a safety vent which is operably connected with the centre lever 5 to prevent release of the closure until the safety vent is opened. In this respect reference is directed to our prior U.K. Patent No. 1603814 for further details.

### CLAIMS (Filed on 11-1-84)

1. A closure for an opening in a pressure pipe or vessel arranged to co-operate with locking means around the opening, the closure comprising a cover, an angularly displaceable member on the cover, a plurality of elongate locking members positioned around the periphery of the cover, and link means extending between the angularly displaceable mem-

ber and the locking members operable to move both ends of each locking member into a locking position upon appropriate angular movement of the displaceable member.

5 2. A closure according to claim 1 wherein the link means comprises a link connected to each end of each locking member and operative to move its respective end into a locking position.

10 3. A closure according to claim 1 or 2 wherein the link means comprises two links for each locking member, one link extending to one end of the locking member and the other link extending to the other end.

15 4. A closure according to claim 1 or 2 wherein the link means includes an eccentric for each locking member on which the locking member is pivoted, angular movement of the angularly displaceable member causing angular movement of the eccentric which moves the pivoted end of the respective locking member into a locking position.

20 5. A closure according to claim 1 or 2 or 4 wherein the link means comprises a first link from the angularly displaceable member to an eccentric member which pivots on the closure and a driving surface engaging a surface on one end of a first locking member, and a  
25 second link pivoted on the eccentric member and an adjacent end of a second locking member whereby the respective ends of the locking members are moved into their locking position.

30 6. A closure according to claim 5 wherein both ends of each locking member move into a locking position at the same time.

35 7. A closure for an opening in a pressure pipe or vessel arranged to co-operate with an annular locking groove or bead around the opening, the closure comprising a cover, an angularly displaceable member on the cover, a plurality of elongate locking members positioned around the periphery of the cover, each pivoted at one end upon a respective  
40 eccentric itself pivoted upon the cover, a plurality of first links one extending from the angularly displaceable member to each eccentric, and a plurality of second links one extending to each of the other ends of the locking members the arrangement being such that, on angular movement of the displaceable  
45 member to lock the closure, the first links cause rotation of the respective eccentrics, the eccentrics move the respective one ends of the locking members into a locking position, and the second links move the other ends of the locking members into a locking  
50 position.

8. A closure according to claim 7 wherein the second links extend one from each eccentric to the other end of an adjacent locking member.

55 9. A closure according to any one of the preceding claims where the angle of engagement of the closure is more than 90%.

10. A closure according to any one of the preceding claims wherein there are four locking members.

60 11. A closure substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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